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Activities for May  
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FOREWORD

I have indicated from time to time to the Chiefs of Divisions--- but perhaps it has not been repeated to the field personnel---that the monthly progress reports have proved of great service in keeping the administrative headquarters in closer touch with the work of field stations. The idea in initiating these reports was to meet just that need.

What is here proposed is therefore distinctly not to place any limitation on the adequate presentation of worth-while results, but rather to encourage a condensation in the interest of saving the time both of the research men and of the division leaders and the Chief of Bureau---the former having to give attention to reports from many stations and the latter intending to study the reports of all stations!

Such condensation will facilitate also the selection of items for the Monthly Letter of the Bureau. It is of course possible to condense and recast in Washington extended statements, but such action is necessarily subject to risk of misinterpretation, and it would be much better to be able to retain the vernacular of the worker.

Many of the reports as now received give rather complete biological or other studies, often of several pages, including tabular matter, graphs, etc.--all valuable and informing--and, as already indicated, it is understood that station leaders or others are to be free to give such details as fully as they may deem necessary to indicate progress of the work. But for the reasons and needs indicated I am going to ask, where fairly long or extended statements seem desirable and are given, that a brief condensation be appended giving the gist of the information. Ability to condense and give short-paragraph information is a most useful accomplishment and often absolutely necessary, as for reports for the information of the Secretary, the Budget, or the Congress, and I hope ability to condense may, through these monthly reports, be developed widely in the personnel of the Bureau.

Furthermore, a little "window dressing" could be used to advantage in connection with some of the items included in monthly reports. In other words, it will often be helpful to indicate in a sentence or two the relationship of the item to the project or to earlier work of the station or of the Bureau. As illustration, your attention is called to the paragraphs in this monthly letter on "Importations of Phorocera agilis R. D. continued" and on "Satin Moth parasite shipped to Washington State."

C. L. M.



GENERAL ITEMS  
(To July 20)

Grasshopper situation.--In an earlier number of the Monthly Letter the record of the effort to secure Federal participation in grasshopper control in the northwestern Mississippi Valley States was brought down to May 20, and included what was then believed to have been final action by the House rejecting the appropriation. Between June 10 and 21, however, the effort to secure Federal funds was twice renewed following many reports of abundance and threatening damage in the general area indicated. Both of these efforts were in connection with the House consideration of the Agricultural Appropriation Bill. The first, June 10-11, was to secure, in view of the lateness of the season, a reduced appropriation of \$750,000 for the purchase by the Department of bait and its distribution to the States in interest, i. e., under the terms of the original item of \$1,450,000. Obviously if it was too late to secure full benefit in the middle of May, an appropriation in the middle of June would be of little use in view of the unavoidable delay in contracts, in purchase by mills of necessary ingredients, poison and molasses, and the manufacture and delivery of the bait to the States. Information to this effect, with the disapproval of the item, was submitted by the Secretary to the House and the effort failed by a very decisive majority.

For the purpose of getting first-hand information on the grasshopper situation, the Chief of Bureau and Dr. Larrimer, with Dr. Parker, field leader in grasshopper investigations, made a survey of the general area on June 16-21. This survey included the States where grasshoppers had been particularly numerous the previous year, namely, northwestern Iowa, north-central Nebraska, southern and central South Dakota, northern and eastern Minnesota, and North Dakota. With the exception of South Dakota, where neither State nor farmers' funds were to be had, all of the States mentioned--now without expectation of Federal assistance--were on their own account purchasing and distributing poison bait, and notably so in Minnesota where State funds amounting to \$250,000 were made available. It seemed apparent, however, that such funds would probably be inadequate in all of these States, with the possible exception of Minnesota, and therefore that there was still a possibility of utilization of Federal aid if it was extended immediately to augment, under existing State contracts, purchases of bait. Substantially this information was given to the Secretary of Agriculture in the course of a telephone call from him to the Chief of Bureau in the field. After assembling full information from State and other sources, and with the approval of the President and the Budget, the Secretary recommended an appropriation item of \$600,000 in a letter to the Chairman of the House Appropriations Committee. This item as drafted authorized direct aid to the States and was offered by Congressman Simmons as an amendment to the Agricultural Bill, but was defeated by a vote of 102 to 72.

In relation to this failure of Federal aid, it is not only fair but a pleasure to report that the threat of grasshopper injury as of July 20 seems to have been very much modified from earlier indications. Notable reduction of grasshoppers by disease and parasites in the north-west Mississippi Valley States is now being reported by Department



and State officials. The small-grain crops being harvested in the southern portions of the area have been but slightly if at all damaged, and fields which were seriously infested two weeks ago and were being badly stripped of foliage, with indication of serious crop losses, have filled out with grain and promise satisfactory yields. In the northern portion of the area--North Dakota and Minnesota--the campaign of poison distribution, under effective organizations, has been very successful, and State officials are confident that the harvest of small grains--still ten days to two weeks distant--will not suffer material losses.

Control by these natural agencies of disease and parasitism has been repeatedly indicated as a possibility. The common type of grasshopper disease is reported as appearing widely where conditions of moisture or humidity are favorable. Some 25 to 30 diseased and dead grasshoppers are reported from Iowa, for example, as often being found clinging to a single stalk. The reverse of the conditions favorable to disease, namely, heat and dryness, is favorable to parasitism. These two control agencies, therefore, supplement each other, and there is a high probability that control by these factors will extend and increase in amount throughout the principal grasshopper areas in the five or more States chiefly concerned.

Luxuriance of roadside and grassland vegetation has, however, been the most important factor in lessening the damage threatened early in the season by holding the grasshoppers in or near their breeding areas and thus protecting the small-grain crops. The almost unprecedented rainfall during May and June, particularly in northwestern Iowa, South Dakota, and northern Nebraska, is responsible for this favorable condition over much of the area, and this is notably true in South Dakota, where very little poisoning has been possible.

The two-striped grasshopper, perhaps the most important of the three or four kinds concerned in the general area, is now practically all winged and the others are rapidly reaching this stage, but so far there has been very little migration to corn, and such migration now represents the major future risk.--C. L. M.

Federal quarantine on European corn borer revoked.--On July 13 Secretary Hyde announced that he had revoked the domestic European corn-borer quarantine and regulations effective July 15. The Secretary stated that this action was taken because of "the failure to obtain funds sufficient to maintain effective control." The announcement also stated, "Revocation of Federal regulations will give uninfested States an opportunity to issue such orders as they may feel necessary for protection against the introduction of infestation. The appropriation will enable the department to continue scouting to determine the limits of distribution of the borer. States outside the infested area will thus be able to keep informed as to the areas to which any State restrictions should apply and infested States will know the territory in which suppressive measures are needed." This statement is included in the Monthly Letter in order that the information may be available to all members of the Bureau.



Bureau appropriation for 1933.--The Act making appropriations to the Department for the present fiscal year was approved by the President on July 7 and later, by joint resolution, made available from the first of July. The amount appropriated to the Bureau of Entomology is \$2,471,700 together with \$55,000 reappropriated. The total available to the Bureau for the fiscal year 1933 is, therefore, \$2,526,700 or \$337,040 less than last year. The major part of this reduction is in the following three items: "Fruit and Shade-Tree Insects," "Cotton Insects," and "Taxonomy and Interrelations of Insects." To prevent the discontinuance of basic work, having a direct bearing on practically all activities of the Bureau, provided for under the item "Taxonomy and Interrelations of Insects," it is proposed to transfer to that item, with corresponding reductions, small amounts from several appropriation items. If we are to continue important work now under way with these reduced amounts it is necessary that the work be conducted as economically as possible. The splendid cooperation in effective and economical conduct of work received from all during the past fiscal year is appreciated. It is, however, urged that everyone exert the same, or even greater, effort during the present year.

#### TRUCK CROP AND GARDEN INSECTS

Barium fluosilicate effective against tobacco flea beetle.--Reporting on field experiments at Quincy, Fla., F. S. Chamberlin says: "The results obtained on the 7-acre field experiment show that careful, well-timed applications of barium fluosilicate (mixed with tobacco dust as a carrier) quickly eliminated overwintered flea beetles (Epitrix parvula Fab.) on young tobacco. Very few second-brood beetles emerged after these treatments. Observations have shown definitely that the first application of poison must be made not later than 4 days after setting if satisfactory results are to be obtained."

Longevity of spotted cucumber beetle.--P. K. Harrison, Baton Rouge, La., reports that "In the laboratory, 6 males and 3 females emerged with cycles of 37 to 49 days. In the insectary, 5 males and 1 female emerged with cycles of 44 to 100 days from egg to adult. The last female of the overwintered beetles retained in confinement died on May 11, after living 142 days, and the last male died on May 28, after living 144 days."

Narcissus bulb fly feeds on various hosts.--C. H. Martin, Sumner, Wash., has observed that adults of Merodon equestris Fab. were "found feeding at flowers of wild strawberry, Fragaria bracteata, buttercup, Ranunculus sp., Potentilla gracilis, and thimbleberry. Strawberry and thimbleberry blossoms seemed to be the most frequented. Adults were observed feeding several hundred yards from a bulb field in a deep fir wood (second growth). They were active during the afternoon in the woods where no breezes were blowing, while in the bulb field where the wind was brisk they remained quiet."

Life history of sweetpotato leaf beetle.--L. W. Brannon, Norfolk, Va., submits a summary of life-history studies conducted during 1931 on



Typophorus viridicyaneus (Crotch). He says: "It was found that the females deposit eggs just beneath the surface of the soil, either attached to the stem of the plant or near the plant. The egg groups are attached together in masses of from 3 to 22, the average number per mass being 8.09. The average incubation period for all eggs deposited during the period July 6 to September 12 was 8.78 days. After hatching the young larvae feed inside the stems of the plants and later inside the potatoes. In late fall the larvae form cells 6 to 8 inches beneath the soil surface and pass the winter in the larval stage. Live larvae have been found in the field in the soil in May, 1932. On May 17 one of these larvae pupated. At this time the first larvae reared in the insectary from eggs deposited during 1931 also pupated. One pupa developed from eggs deposited on August 17, 1931. The incubation period covered 11 days and the larval period 264 days. In another record there is an 8-day incubation period and a 252-day larval period. The average length of life of all adults collected in the field on June 23, 1931, was 44 days. The last adult died on September 18, or 88 days after collection."

Consumption of fat content by beet leaf hoppers in migration.--R. A. Fulton, Twin Falls, Idaho, in cooperation with E. W. Davis, of the Salt Lake laboratory, has made a study of progressive decrease of fat content of leaf hoppers in course of migration from breeding areas in southern Utah and Nevada to beet-growing districts of northern Utah, in connection with the recent Utah migration. Mr. Fulton says: "The fat content decreases inversely with the distance flown," and states, "This indicates that the migratory movement requires a very large energy consumption on the part of the participating individuals and emphasizes the function and importance of the fat content in providing reserve energy for the movement." This is more fully explained in a table submitted, and it is stated that: "Evidently the saturated glycerides comprise the fraction first or most readily utilized by the dispersing insect. This is exactly similar to what occurs during hibernation where the leafhopper starts out with a fat reserve of a solid consistency and ends with one of a semifluid nature."

Behavior in May of the lima bean pod borer in California.--Rodney Cecil, Ventura, Calif., has submitted a detailed study of the pupation, emergence, preoviposition period, oviposition, incubation, and larval life, particularly in relation to the May period, of the lima bean pod borer (Etiella zinckenella Treit.)--too detailed for the Monthly Letter.

Soil types preferred for oviposition by the wireworm Pheletes canus Lec.--E. W. Jones, Walla Walla, Wash., reports "an experiment to investigate oviposition site preferences of P. canus under controlled field cage conditions of soil texture, compactness, moisture, and cover." The details are of much interest but inappropriate for the Letter. In conclusion he says: "In summary this study of the relation of the selection of oviposition sites to the soil conditions shows that P. canus prefers fine sandy loam soil to clay loam soil; prefers loose moist soil to wet packed soil."



## FOREST INSECTS

Importations of Phorocera agilis R. D. continued.--R. C. Brown, of the gipsy moth laboratory, Melrose Highlands, Mass., reports receipt last year from Europe of a total of 151,225 puparia of this species, and from these 46,963 flies were obtained--an emergence of 31.05 per cent. Reference to a summary of importations of this fly indicates that several hundred thousand puparia have been imported, beginning in 1907, and that in Europe it is an important parasite of the gipsy moth, and it is for this reason that its importation is being continued. Up to 1931 the recovery of this parasitoid, and in small numbers, has been made from only one locality. Mr. Brown now indicates that an adult of this species was obtained last year from gipsy-moth larvae collected in Ipswich, Mass., and that "Other puparia, probably of this tachinid, were secured last year from gipsy moth caterpillars collected at Ipswich and the adjoining town of Boxford." He states also that "Phorocera agilis has been recovered each year in small numbers from Boxford or vicinity since 1928, when the last colonies were put out there, but it has never been recovered from other towns where it was liberated."

Satin moth parasite to be shipped to Washington State.--A. B. Proper, Melrose Highlands, Mass., reports details of plans for a considerable shipment of Apanteles solitarius Ratz. to the State of Washington as a possible aid in the control of the satin moth, now well established there over certain areas. This parasite was originally imported from Hungary in 1927 for distribution in Massachusetts and New Hampshire, where the satin moth had gained notable establishment. This importation was immediately successful--at least in establishment of the parasite--and no further importations have been made.

Host-relation studies of European parasite of the pine shoot moth.--P. A. Berry, Melrose Highlands, has been studying the host relations of Tetrastichus turionum Hartig, received as larvae last year from Europe. The bulk of the shipment is being held in cold storage, but from about one-seventh of the lot some 1,181 males and 2,787 females have been secured. In reference to the habits of this parasite, he states: "In all cases of oviposition noted it has taken place through the plant tissues although naked larvae and pupae have been exposed. Eggs of the parasite have hatched and the larvae are developing. Larvae and pupae of other Lepidoptera have been exposed and dissected but no eggs were found. Cocoons of hymenopterous parasites and puparia of dipterous parasites have been exposed. No oviposition was observed and dissections failed to show any eggs in anything exposed except the pine shoot moth (Rhyacionia buoliana Schiff.).

New parasite of larch case bearer noted.--P. B. Dowden, Melrose Highlands, states that "on May 19 R. R. Whitten and S. F. Potts noted a small parasite working on Haploptilia laricella Hbn. at Arlington,



Mass. Mr. Parker and I collected five females and I was able to make a few observations on it. It is a species of *Microbracon*, which readily attacks *H. laricella*. The host larva is paralyzed and an egg laid externally. The egg hatches in about 30 hours and the issuing larva feeds very rapidly, completing development in about 5 days. It then pushes the host larval remains out of the case and spins a light cocoon. Pupation takes place about eight days after the egg is laid."

Oil-burning feasible for control of pine beetle.--F. P. Keen and W. J. Buckhorn, of the mountain pine beetle control project in Crater National Park, report that "Experiments were carried out with a modification of the oil-burning method used on standing trees in the Rocky Mountain region. In this instance trees were felled, limbed, and then sprayed with an oil of low specific gravity, using one of the "flame-thrower" back pumps. Then the logs were set on fire and the flames carried along the trunk by squirting on a small quantity of additional oil. Only about one-half gallon of oil was required to completely scorch an average-sized tree and the whole process of burning and rolling took only about 3 minutes. A very satisfactory kill of the brood under the thin bark was secured. Since this oil can be purchased for about 6 cents per gallon, it is estimated that the additional cost of this method of treating over the sun-curing method will not exceed 15 cents per tree."

Caterpillar tractor lowers cost of pine beetle control.---"For a decade," reports A. J. Jaenicke, Forest Examiner for Region Six, "the average cost of cutting, peeling, and burning ponderosa pine trees infested with the western pine beetle has been about \$4 per thousand board feet on the control projects in Oregon. \* \* \* In November, 1931, the Fremont National Forest pioneered an experiment \* \* \* on one of its control projects in ponderosa pine. Instead of peeling and burning the infested trees individually the infested portions of the tree trunks were decked into piles by caterpillar 60 and then burned. \* \* \* With the experience of the Fremont experiment as a basis, the Deschutes National Forest in March, 1932, carried out a ponderosa pine control project with the aid of a 'caterpillar 60' and a 'caterpillar 20' at a cost which establishes a new record for western pine beetle control costs in Oregon. By the regular "cut, peel, and burn" method, the cost would probably have been \$3.60 per thousand board feet. The Deschutes did the job for less than \$2 per thousand board feet by good management and skillful handling of the caterpillars. \* \* \* Where the caterpillar (tractor) method can be used at a saving, it has the following advantages: (1) It enables control work to start before the final close of the fire season in the fall. Piles can be prepared in advance and burning delayed till arrival of safe burning conditions; (2) it reduces the amount of inflammable material on the ground. The log piles burn up completely. The scattered trees are merely charred slightly; (3) it lowers the danger of the spread of fires by greatly reducing their number and concentrating them where they do not scorch trees or reproduction; (4) it is more effective in the destruction of the beetles, as 100 per cent of the bark is destroyed, allowing no possible chance for beetles to escape."



Peeling method not effective against Douglas fir beetle.---W. D. Bedard spent the month of May in the field at Sullivan Lake, Idaho, and reports that "One of the outstanding developments of the month is the checking of the peeling method of control against the Douglas fir beetle. In the fall of 1931, infested trees were felled and the bark peeled, which was allowed to lie under the snow over winter. Early in May some 30 square feet of this bark was collected and placed in rearing cans in order to see if there would be any emergence from the beetles which normally overwinter concealed within the inner bark. On May 13, these beetles began to emerge and attack the green material placed within the cages. The result of this experiment shows that the peeling method of control against the Douglas fir beetle is indeed very questionable and that the bark should be burned if the work is to be made effective."

Environmental factors control locust borer.---Ralph C. Hall reports that in a spraying experiment at Columbus, Ohio, it was found that more than 85 per cent of the young larvae of the locust borer in the control trees "had been killed by natural causes by May 18 at the time when they were checked against the sprayed trees." No insect or other animal was observed in the act of destroying the larvae.

The Tahoe bark-beetle control project.---At the request of the Forest Service, G. R. Struble, of the bark-beetle control project, Berkeley, Calif., made a survey of the Lake Tahoe Control Project on the Eldorado National Forest, May 17 to 21. This project was initiated in October, 1931. The owner of the Anita Baldwin Estate deposited \$1,000 with the Forest Service to carry out the work on its private lands, a tract of 2,000 acres. The project includes also about 160 acres of national forest land. In both the fall and spring surveys a total of 258 infested trees, with a volume of 358,450 board feet, have been marked for treatment.

Western pine beetle follows fire.---An examination of the Sugar Hill fire plots on the Modoc National Forest was made by Dr. K. A. Salman in May. These plots were established in 1929, following a severe fire which swept the area during the preceding summer. Of the 155 trees tagged on these plots 17 were found that had been killed during the season of 1931; eight were summer-brood trees, two windfalls, and seven winter-brood trees. The attacks of 1931 were heavy, and the western pine beetle predominated as the cause of death.

Cooperation in reporting destruction of insects.---At the request of the Oregon State Forester, F. P. Keen, of the Portland, Oreg., field laboratory, attended the conference of State Fire Wardens at Salem and spent a morning with them in discussing how to recognize outbreaks of destructive forest insects, particularly the hemlock looper. A plan of cooperation was developed whereby each fire warden in zones of possible looper damage will act as a looper scout. During October of each year this will be again called to their attention and any suspicious flight of



moths reported. Bark-beetle outbreaks are now being watched by the protective associations east of the Cascades and by the Forest Service on areas under their jurisdiction.

Airplane dusting against hemlock looper.--J. A. Beal, Portland, Oreg., attended a meeting of the Gray's Harbor Chamber of Commerce, called to consider what should be done about the new outbreak of hemlock looper covering some 30,000 acres in that county. Mr. Beal advised against airplane dusting on such a large area where the extent and location of egg laying was not known and where the infestation was no longer localized as on the Pacific County area treated by airplane dusting last year.

### CEREAL AND FORAGE INSECTS

Foreign parasites of the sugarcane borer liberated in Florida.--W. E. Haley, of the New Orleans, La., laboratory, spent 10 days at Miami, Fla., in May liberating foreign parasites of the sugarcane borer (Diatraea saccharalis Fab.) in the cane growing sections of the Everglades. These were adults only of the dextiid fly Paratheresia clari-palpis Tns. and the braconid wasp Ipobracon rimac Wolcott, shipped by airplane directly from Trujillo, Peru, to Miami. Mr. Haley, travelling by automobile, brought with him from New Orleans also a consignment of the dextiid in a well-ventilated cage. This consignment arrived in excellent condition.

Parasite of gray sugarcane mealy bug introduced.--T. E. Holloway, of the New Orleans laboratory, reports that, through O. H. Swezy, of the Hawaiian Sugar Planters' Association, four shipments of Pseudococcus terryi Full., a promising parasite of the gray sugarcane mealy bug (Pseudococcus boninsis Kuw.), have been received at the New Orleans laboratory. These shipments were made by steamer cold room, from Honolulu to San Pedro, Calif., where they were received by A. P. Messenger, of the California State Department of Agriculture. Mr. Messenger transhipped them by airplane to New Orleans, where the parasite is now being bred successfully and is being released in Louisiana cane fields.

Alfalfa weevil discovered in San Joaquin Valley.--R. A. Blanchard, Sacramento, Calif., reports that Hypera postica Gyll. "was discovered in an alfalfa field 3 miles east of Tracy, Calif., in the northern San Joaquin Valley on May 12. Only one adult was taken at that time. A survey of the area immediately around Tracy, on May 14, showed only a very light infestation. On June 2 a rather heavy infestation with considerable damage to spots in some fields was observed near Pleasanton in the Livermore Valley. Such damage occurred particularly near the fence rows. Sweepings in two fields gave an average of 97 larvae and 12 adults per 100 sweeps with a 12-inch net, with a range from 10 to 222 larvae and 2 to 32 adults. Ground and plant examinations showed an average of 3.8 adults per plant and 2.4 pupae or larvae in cocoons. All stages of larvae were swept in the field."



Hymenopterous parasite of alfalfa weevil abundant.--S. J. Snow, reporting from Fallon, Nev., says "Bathyplectes curculionis Thoms. adults have been swept repeatedly, often with a catch of five or six to every 25 strokes. More than half of the weevil cocoons examined have contained the cocoons of this common parasite."

Toxoptera graminum Rond. as a pest on timothy.--"A field of timothy near Carlisle, Pa., was found by J. S. Pinckney on May 9 to be heavily infested with Toxoptera graminum," reports Chas. C. Hill. "At this time Mr. Pinckney observed that the field was already showing all the characteristic 'spots' of this type of infestation, scattered throughout the field and varying in size from a few feet in diameter to 20 yards. The field has now been entirely ruined from this cause and will be plowed up. It is unusual to find serious infestation from this species of aphid in this section of the country, and F. M. Wadley believes that it has never before been reported as working on timothy in injurious abundance. These aphids were plentiful in near-by oat and timothy fields but were not doing any outstanding injury to them. The determination of the species was verified by F. M. Wadley."

Wheat joint worm issues late in Oregon.--T. R. Chamberlin, Forest Grove, Oreg., reports that "The first adults (of Harmolita tritici Fitch) issued in the Molalla, Oreg., district on May 6, 9 days later than the first issuance in 1931 and 19 days later than in 1930. According to our studies of accumulated temperatures above 40° F. for the daily means of February, March, and April during the past seasons, emergence would have been expected on about the same day as last year, but exceptional cloudiness with rain and low maximum temperatures in the spring of 1932 produced, agriculturally, an unusually late season and doubtless these conditions retarded the issuance of H. tritici. As in former years, there was considerable variation in the amount of issuance in different fields on a given date, examination of stubble showing practically no issuance in some fields by May 16."

Behavior of wheat joint worm in locating wheat-stem nodes.--"Just how the adult of Harmolita tritici locates the covered and invisible nodes (of the wheat stem) has been conjectural," says F. F. Dicke, of the Charlottesville, Va., laboratory. "Recent studies have revealed that only nodes that have developed so as to come in firm contact with the surrounding sheath, or those exposed beyond the sheath, are susceptible to oviposition. The nodes are located by the vibratory tapping of the sheath with the antennal clubs of the insect. It is apparent, since the stem is solid at the node, that this point is perceived by the sense of touch. The insect encounters considerable difficulty in placing eggs at exposed nodes, probably because the tissues have lignified considerably at this stage of nodal development."

Survival of corn-earworm pupae high in Virginia.--Mr. Dicke also reports that "pupal survival of Heliothis obsoleta Fab. in hibernation cages examined on May 15 was higher than in recent years. The average



survival in three types of soil was 25 per cent. Adult emergence of the earworm from hibernation cages began on May 28."

Low-temperature tolerance of eggs of the range caterpillar parasitized by *Anastatus semiflavus* Gahan.--A. M. Barnes, of the Tempe, Ariz., laboratory, reports: "A series of experiments in which parasitized eggs of *Hemileuca oliviae* Ckll. were refrigerated for approximately 3 months at temperatures of 35°, 38°, 42°, and 46° F. has been completed. The parasitized *Hemileuca oliviae* eggs used in the refrigeration at each temperature were divided into three groups as follows: Eggs placed directly in refrigerator when taken from parasite cages; eggs incubated for 9 days at 80° F. before refrigeration; and eggs incubated for 18 days at 80° F. before refrigeration--16,620 parasitized *Hemileuca oliviae* eggs were used in the tests. After refrigeration the parasitized eggs were incubated at 80° to 85° F. until emergence of parasites ceased. The host eggs were then cleared and living parasites found therein were recorded. A study of the records secured may be briefly summarized as follows: Parasitized *Hemileuca oliviae* eggs taken directly from the parasite cages and placed in electric refrigerators at temperatures of 35°, 38°, 42°, and 46° F. for periods varying from 75 to 90 days gave entirely negative results. No parasites survived. Parasitized eggs incubated 9 days before refrigeration and then refrigerated for periods of 77 to 90 days gave the following percentages of parasite survival: At 35° F., 22.23 per cent; at 38° F., 57.43 per cent; at 42° F., 69.56 per cent; at 46° F., 71.88 per cent. This work is being continued using 6, 9, and 12 months as the time factor with 6, 9, 12, 15, and 18 days preincubation period."

#### COTTON INSECTS

Field cricket studies at Tallulah, La.--J. W. Folsom and P. A. Woke, report that "Progress is being made in the study of the field cricket *Gryllus assimilis pennsylvanicus* Burm. in relation to the cotton plant. Eleven females deposited a total of 3,327 eggs. Hatching began during the second week of May. About one-third of the nymphs are now second instars. Before May 15 all the adults that were seen were of the short-winged form. Since May 15 several of the long-winged form have appeared."

Life history of tarnished plant bug in Louisiana.--K. P. Ewing and R. L. McGarr, Tallulah, report that "A total of 27 pairs of adults of *Lygus pratensis* L. have been confined during March, April, and May for life records. The average life of 23 females was 27.31 days, the maximum life being 62 days and the minimum 3 days. The average life of 18 males was 30.61 days, the maximum period being 59 days and the minimum 2 days. The life of both sexes was considerably longer in March and April than in May. Seventeen of the 23 females oviposited, with an average of 40.09 eggs per female. The maximum number of eggs deposited by a single female was 124. \* \* \* The average nymphal per-



iod for 30 individuals was 20.7 days, the maximum period being 25 days and the minimum 18 days. The average number of days in the different stages is as follows: First instar, 4.07 days; second instar, 3.1 days; third instar, 3.37 days; fourth instar, 4.37 days; and fifth instar, 5.8 days. Sixteen of the adults were females and 14 were males. The host plant was Erigeron philadelphicus L.\*\*\* The average incubation period for 225 eggs was 10.32 days, the maximum being 14 and the minimum 9 days."

Emergence of boll weevils in cotton fields.--M. T. Young, Tallulah, reports as follows on field plat tests: "Plant examinations to determine the rate of boll weevil emergence in cotton fields were begun on May 10. A number of cotton fields were selected at various distances from favorable or unfavorable hibernation quarters in such a manner that the series as a whole would represent the average weevil emergence for this locality. These fields were examined in the usual manner at weekly intervals." The highest figures were obtained for the week ending May 30, when 654 weevils were found on 34,600 plants, or 53 plants per weevil. "This is probably the greatest emergence that has occurred at Tallulah in many years."

Boll weevil emergence in hibernation cages.--"The daily observations," by G. L. Smith and others, Tallulah, "of the active weevils in the 70 hibernation cages were discontinued on April 30 and on May 2 the daily removal of all weevils emerging in these cages was begun. \* \* \* the emergences of weevils in Series 19 for the two types of shelter and three dates of installation are compared. \* \* \* it is seen that a larger number of weevils emerged during the period from May 16 to 31 than from May 1 to 15. Also, that during the period May 1 to 31, 810 weevils emerged from the 10,000 installed on October 15, as compared with 824 from the 10,000 installed on October 31, and 1,722 from 10,000 installed on November 14. More than twice as many weevils have emerged from those installed November 14 than from those installed October 15 or October 31, and the number emerging from the two October installations is practically the same. The number of weevils emerging from the cages located in the timber is much less than that in the open field. Exactly twice as many weevils have emerged from the leafage shelter as from the moss shelter. The difference in emergence from the Spanish moss and cornstalk shelter in the open field is very little."

Note to foregoing item.--This is the first report on the new plan of hibernation tests which were authorized during the fall of 1931, and it brings out one of the points there in mind, namely, that to get any significant picture of weevil survival in such cage tests it is desirable to begin stocking cages at the time when the weevils are normally entering hibernation, which is usually in November or later, depending on the season. It has also eliminated the error of interpretation which undoubtedly has resulted from the practice hitherto of removing active weevils beginning with March, whenever, as a result of a bright, warm day, a little activity was exhibited. In these experi-



ments such removal was begun two months later, in May--in other words, scheduled to meet the normal activity of the weevils in relation to available new cotton. A limited number of natural shelters were also used in these experiments, excluding a number of types of shelters and material which had little or no relation to any normal hibernating conditions. - C. L. M.

Cooperative boll weevil cage hibernation tests.--R. C. Gaines Tallulah, presents "a summary of boll weevil emergence in hibernation cages at the various State and Federal stations. \* \* \* At stations where the records are available on emergence in cages prior to June 1, comparisons with previous years' records are interesting. At Poplarville, Miss.. 0.53 per cent of the weevils had emerged prior to June 1 in 1932, as compared with 0 per cent in 1929, 0.10 per cent in 1928, 0.20 per cent in 1927, and 0.10 per cent in 1926. At Auburn, Alabama, 5.47 per cent of the weevils had emerged prior to June 1 in 1932, as compared with 0.20 per cent in 1929, 0.07 per cent in 1928, 0.24 per cent in 1927, 0.60 per cent in 1926, and 14.80 per cent in 1925. \* \* \* At Tallulah 10.27 per cent of the weevils had emerged prior to June 1, by far the highest figure ever recorded at this station, the average for the years of 1916 to 1931, inclusive, being less than 1.00 per cent."

Boll weevil hibernation at College Station, Tex.--E. W. Dunnam and R. W. Moreland report that "The number of weevils emerging from the hibernation cages this month was somewhat less than that of last month. \* \* \* The three series of weevils installed in moss are yet yielding more weevils than the three series installed in cornstalks. It is interesting to note that in the two woods series this is the first month that more weevils were taken from the moss than from the leaves. We have observed right along that proportionately more weevils emerge from the November 1 moss cages in the woods than from the November 1 moss cages located in the field."

Chemotropism of boll weevil.--G. L. Smith and assistants submit from Tallulah, La., "a summary of the results of the chemotropic studies of the boll weevil during February, March, and April, when green cotton plants were absent from the fields. The greatest gain (recorded) for trymethylamine over the untreated flight screens was 31.6 per cent, with 4 per cent solution of trimethylamine. The greatest gain for ammonium hydroxide over the untreated screens was 20.3 per cent, with a 1-1/3 per cent solution. Comparing trimethylamine with ammonium hydroxide, the 4 per cent solution of trimethylamine showed a gain of 13.6 per cent over 4 per cent solution of ammonium hydroxide, but trimethylamine showed a loss of 13.9 per cent when compared with 1 per cent solution of ammonium hydroxide."

#### INSECTS AFFECTING MAN AND ANIMALS

Sand-fly larvae killed by creosoted pine sap.--W. E. Dove, Charleston, S. C., reports that "Spray tests made with creosoted pine sap during the spring gave a kill of sand fly larvae ranging from 72 to 76 per cent. The spray treatments were not made on the open marshes.



The number of sand flies emerging from the open marshes in the spring show that the spray treatments would have given a better control if they had been applied during the hot weather of last summer. \* \* \* To control such pests by spraying would mean that it would be necessary to spray the areas following each of the high tides."

Note on oviposition of yellow fever mosquito.--"In connection with rearing a large number of Aedes aegypti L. for motion-picture work," reports G. H. Bradley, Orlando, Fla., "it was noted that the females laid their eggs on the water surface rather than on the sides of the jars above the water line. The eggs are often seen on the sides of the jars above the water but in my recent observations they were merely drawn to the side of the jar by capillary attraction and stranded by the receding water. About the time I noticed this J. L. Webb sent me an abstract of an article by Roubaud,<sup>1/</sup> in which it is stated that given a free choice the female deposits her eggs above the water when the water is pure, but on the water when the water contains organic matter and microbes. After receiving this abstract I put two dishes, one with tap water and one with distilled water, in a breeding cage in which was also a jar of contaminated water. During a period of one week no eggs were laid on the clear waters. Upon removing the jars with contaminated water and replacing the jars holding tap water and distilled water, eggs were laid on the surface of the water in both jars, and young larvae subsequently appeared."

#### STORED PRODUCT INSECTS

Parasitism of the raisin moth in California.--Work by Dwight F. Barnes and Heber C. Donohoe at Fresno, Calif., "indicates that 241 overwintered larvae of Ephestia figuliella Greg. taken from vines in 9 vineyards, from March 1 to 9, have been parasitized in the fall to the extent of 19.6 per cent (18.3 per cent by the ichneumonids Mesostenus gracilis Cress. and Nemeritis canescens Grav. and 1.3 per cent by Microbracon hebetor Say). An important increase in parasitism since the beginning of warmer weather is shown by the examinations of vines on May 11 and 25."

Result of a trapping experiment at Fresno.--Perez Simmons, Fresno, Calif., reports that "Captures of moths that infest dried fruits and other stored products, and of parasites, were as follows for the period April 12 to May 24. (The first raisin moths and specimens of Microbracon hebetor Say were taken April 19.) The trapping, with malt-sirup

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<sup>1/</sup>Roubaud, E.--Faits nouveau concernant la vie et la destruction du moustique de la fevre jaune. Acad. Sci. Coloniales, Compt. Rend. Séances. Communic. 10: 241-249. 1927-28 (1929)

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bait pails, was done in two vineyards and one fig orchard, using three traps in each location.

<u>Ephestia figuliella</u> Greg. ....	430
<u>Ephestia elutella</u> Hbn. ....	8
<u>Ephestia kuehniella</u> Zell. ....	11
<u>Ephestiodes nigrella</u> Hulst. ....	3
<u>Plodia interpunctella</u> Hbn. ....	1
<u>Pyrallis farinalis</u> L. ....	12
<u>Microbracon hebetor</u> Say (parasite).....	99
<u>Nemeritis canescens</u> Grav. (parasite).....	7
<u>Mesostenus gracilis</u> Cress. (parasite).....	51
<u>Ephialtes exareolata</u> Ashm. (parasite).....	1"

Celluloid rearing vials prove practicable.--C. H. Donohoe reports "additional data to show that celluloid rearing vials are more favorable than vials of glass. Reared under identical temperatures in an incubator on the same foods a small series of larvae in glass required an average of 67.6 days for development, whereas a small series in celluloid required 60.3 days."

Activity of pea weevils.--A. O. Larson, Corvallis, Oreg., reports: "The first pea weevil eggs were found on May 9 on early peas at the experiment station plots. These eggs had been laid on the 8th. On the 9th we first observed weevils mating."

At Moscow, Idaho, according to Tom Brindley, "Weevils were found feeding on the pollen of Cogswellia (Cogswellia sp.) and resting among the leaves of the Montana pea (Thermopsis montanum) and alfalfa. Dissections of weevils collected in the field showed well-developed ovaries, whereas those in hibernation showed little development. One of the most interesting observations of the month was the finding of live pea weevils overwintering among the debris left on a pea field. Early this spring a cage covering 12 square feet of ground was placed in a pea field where the peas had been poorly harvested. Eight live weevils were taken from this cage. This adds another bit of evidence to substantiate the fact that the weevils do not have to have trees, posts, etc., to pass the winter successfully."

## TOXICOLOGY AND PHYSIOLOGY OF INSECTS

Successful diet for cockroaches.--M. C. Swingle, Takoma Park, Md., reports that "In the eighty feeding experiments now being carried on with Periplaneta americana L., only two diets have so far produced adults. Five months and 12 days were required to produce adults when the roaches were fed on raw steak and tap water. With oatmeal and lettuce, 5 months and 15 days were required. The difference between these two diets is negligible as far as growth is concerned but it is possible that some difference will be noted in egg production." Development is progressing under the other diets.



Pulverized roach appetizing to *Periplaneta americana* L.--Mr. Swingle states that "In cooperation with E. H. Siegler and Francis Munger, of this laboratory, a new method of feeding insecticides was tried out on the American roach. By grinding the body of a roach in a mortar an efficient attractant was obtained which could easily be mixed with the sample of the insecticide to be tested. By this method it was a simple matter to feed a roach unbelievable quantities of nearly pure lead arsenate. A single roach could be fed enough lead arsenate to kill several hundred roaches. However, within a few hours, the roaches regurgitated the entire quantity of poison eaten. After regurgitation they refused to eat more of the food, although they still seemed to be attracted to it. By reducing the concentration of the lead arsenate it was possible to minimize the regurgitation and secure a reasonable number of mortalities. With this in mind, several experiments were tried with formic, stearic, and oleic green. The insects were attracted to the food from a distance and would run over it, touching it here and there with their palpi, but in all cases would finally walk away without eating. There is evidently an odor or taste to the members of the Paris green series which can be detected by the palpi of the insect. Food pellets were made up containing bare traces of the greens but in each case the poison was detected. Materials like potassium iodide could also be detected with ease by the roaches. It is very strange that lead arsenate could not be detected even when present in extreme concentrations while any other materials, much less poisonous, could be detected in minute amounts. At any rate this method of mixing ground roach with the insecticide would not work with the homologs of Paris green."

Metabolic activity of codling moth during hibernation.--D. E. Fink, of the Takoma Park laboratory, reports the conclusion for the present of his studies on the metabolic activity during hibernation of *Carpocapsa pomonella* L. He summarizes the data as follows: "First, during the course of hibernation the larvae lost 25 per cent of their weight, but the water and glucose content remain practically the same; second, glycogen is reduced about one-half (51 per cent) and fat about one-seventh (14 per cent); third, a substantial increase in the total nitrogen content (nearly 15 per cent) occurs toward the end of the hibernation period. The chemical changes that take place in the hibernating larvae are rather remarkable, especially if we remember that during the entire period no food is available or utilized by the larvae and that all the chemical changes that do occur indicate a transformation of one substance from another of material stored in the tissues of the larvae previous to hibernation. The ultimate purpose for these chemical changes appears to be primarily for metamorphosis."

#### BEE CULTURE

The new bee disease in Georgia and Florida.--A new bee disease resembling European foulbrood has been referred to incidentally in recent numbers of the Bureau Monthly Letter. This disease was first brought to the attention of the Bee Culture Laboratory of the Bureau



in 1931 in connection with material received from southern Georgia, and this led to the establishment of a temporary laboratory at Thomasville for the study of the disease in cooperation with State officials. C. E. Burnside, detailed to this work, reports that "The disease resembles European foulbrood in its gross symptoms. Worker, drone, and queen brood are killed, and among worker brood, larvae, prepupae, and pupae were found bees dead of the disease. No dead queen or drone pupae were found. \* \* \* The new disease was first located in Suwannee County, Fla., where three heavily infected apiaries were found. In April several infected apiaries were also found in southern Georgia in the vicinity of Haylow, Homer, and Valdosta."

### FRUIT AND SHADE TREE INSECTS

Oil sprays must have high concentration to kill obscure scale on pecan.--Howard Baker, in charge of the pecan insect laboratory at Shreveport, La., has just submitted a comprehensive summary of the results obtained in the spraying of pecan trees with various oils for the control of Chrysomphalus obscurus Comst. A high concentration of oil has been found necessary for the control of this scale insect. Whereas 2 to 3 per cent of oil is usually effective with the San Jose scale, the obscure scale requires 4 to 6 per cent of similar oils. Unfortunately, the pecan tree has been found to be unusually subject to injury by oil sprays. A 4 per cent oil spray is all that can be used with safety during the dormant season, unless the trees are in a vigorous, healthy condition, in which case 5 per cent or even 6 per cent of oil may be used. No "significant" differences have appeared among various oils tested, with viscosities varying from 55 to 230 seconds Saybolt.

Trichogramma strains vary in increase.--Herbert Spencer and Luther Brown, who are engaged in the production and colonization of parasites of pecan insects at Albany, Ga., report: "For several months four different strains of Trichogramma have been reared side by side in this laboratory, under identical moisture and temperature conditions, and have been furnished at all times with an excess of host eggs for oviposition. The rates of increase of these four strains have differed so greatly, especially after the arrival of hot weather, that we have practically had to abandon two strains." The report indicates that the females of the inferior strains were bright yellow, whereas the stronger strains were characterized by dark-colored females. The former were obtained respectively from shuckworm eggs in September, 1931, and from cutworm eggs in February, 1932. The dark strains were obtained from cotton insect eggs in Arizona and from sugarcane borer eggs in Louisiana.

Effect of different types of sprays on entomogenous fungi in Florida.--S. B. Hill, jr., W. W. Yothers, and Ralph L. Miller, Orlando, Fla., report the effects, after the lapse of eight months, of various arsenical, copper, and other insecticides on entomogenous fungi. These fungi are particularly useful in the control of the citrus white fly and also of the purple scale. The control of the white fly on unsprayed trees is given



as 85 to 95 per cent, and of the purple scale, 60 per cent. When lead arsenate, cryolite, or potassium aluminum fluoride were sprayed on citrus trees the percentage of living white fly pupae at the end of eight months was from one and one-half to five times as great as on unsprayed plots. With copper compounds the white fly pupae were five to ten times as numerous as on the check plots. With Bordeaux mixture the fungous control was cut to 45 to 50 per cent. In the case of the purple scale, copper compounds doubled the increase of the scale; lead arsenate, cryolite, and aluminum fluoride were without effect either on fungus or on scale; and Bordeaux mixture reduced the fungus control of the purple scale to 20 per cent.

Lack of oxygen (not pressure) kills fruit flies and larvae in vacuum.---A. C. Mitchell, of the Mediterranean fruit fly laboratory at Honolulu, T. H., has been studying over a considerable period the effect of vacuum on Mediterranean fruit fly adults and larvae. He makes the following comment on his experiments: "As the flies and larvae have open tracheal systems, the pressure must adjust itself rapidly throughout the bodies of the insects. If death were due to the reduced pressure, there would be little likelihood of survival for such long periods of time as were noted. The comparison of adults exposed to 1 cm and 2 cm of mercury showed that the survival period at the lower pressure was roughly half that at the higher, and the oxygen tension at 1 cm was of course half that at 2 cm. These various observations lead to the conclusion that it is not the reduction in pressure so much as the lack of oxygen that is the cause of death. And another conclusion would be that larvae have lower oxygen requirements than adults, at least in the last stages (as the larvae tested were in the third instar, and nearly ready to pupate). It is expected that it will be possible to check this conclusion directly by means of respirometer readings."

Promising poisons for fruit flies.---Among the numerous poisons for use in baits for various species of fruit flies tested by James Zetek, in charge of the Canal Zone laboratory, tartar emetic and borax have been found promising. Of the two materials tartar emetic (tartrate of antimony and potassium) is much more rapid in its killing effect. Mr. Zetek says: "At the rate of 8 pounds to 100 gallons of water, with 5 gallons of molasses, all of Anastrepha fraterculus Wied. died in 24 hours. Using only half the amount, at least 4 full days were necessary to kill all adults. Molasses at the rate of 5 per cent seems to be sufficient. I could note no effect of the spray on either mango or citrus trees."

Oriental fruit moths not caught after dark.---L. F. Steiner, Cornelia, Ga., reports that "Preliminary observations indicate that most moths are captured by traps during the short period preceding darkness in the evening and for a few hours in the morning, if weather conditions are favorable."

Low temperatures control the orange maggot.---Summarizing the results of temperature experiments at the Mexico City laboratory, A. C. Baker



and W. E. Stone state: "Larvae of Anastrepha ludens Loew may be exposed to low temperatures (30° to 31° F.) for exceedingly long periods without immediate death resulting. Larvae showing life after exposures, however, are not to be considered dangerous, as they appear to be fatally injured. No larvae exposed to low temperatures for a period exceeding 10 days have succeeded in developing into puparia from which adults emerged. These results are very similar to those obtained on the Mediterranean fruit fly and the two series of results tend therefore each to confirm the other."

#### JAPANESE BEETLE AND ASIATIC BEETLE RESEARCH

Grubs of Asiatic garden beetle prefer dandelion roots.--I. M. Hawley has made a study of grub population in the Chestnut Hill district of Pennsylvania, resulting in determination of an average of 7.8 grubs per square foot. He states: "It was noted last fall, as well as this spring, that grubs were unusually abundant about dwarf dandelion, a weed common in this locality. Four diggings where this plant was growing yielded 67 grubs, with an average of 16.8 per square foot."

Flooding as control for Japanese beetle.--F. E. Baker, of the Moorestown, N. J., laboratory, reports final observations on larvae which had been submerged in a cranberry bog for 150 days, the normal flooding period. "The results of the final observations on these larvae are as follows: Larvae 150 days under water, 23.0 per cent normal; larvae 150 days in unflooded field, 98.0 per cent normal. It is apparent that normal flooding will not free a cranberry bog of its entire infestation, but it may reduce the number below that which would cause any appreciable damage."

Lead arsenate treatment of soil in deciduous and evergreen nursery stock effective in grub control.--W. E. Fleming and F. E. Baker, Moorestown, report: "Two strips 1 foot wide the entire length of each of the sections containing young evergreens and shrubs have been dug and examined for Japanese beetle larvae. These sections were treated with acid lead arsenate at various dosages in 1930 before the plants were set in and have been handled the same as a certified nursery block at a commercial nursery by adding sufficient lead arsenate in 1931 to bring the concentration of each section back to its original strength. The results of these surveys of 420 square feet per section are as follows: Larval recovery at 1,000 pounds per acre, 0; at 1,500 pounds per acre, 0; at 2,000 pounds per acre, 0; check, 100."

Colonies of Tiphia vernalis gain in strength.--"The entire staff of the parasite section at the Moorestown laboratory assisted J. W. Ballock in the recovery work on Tiphia vernalis Roh.," reports C. H. Hadley. "Twenty-one colonies were scouted and ten recoveries were made; two in New Jersey, seven in Pennsylvania, and one at Flushing, Long Island. The



T. vernalis colonies at Berlin, N. J., Philmont, Pa., Laurel Hill Cemetery, Pa., and Marion Golf Course at Marion, Pa., were exceedingly strong, indicating considerable growth during the past year."

Native May beetle grub proves possible host of Japanese beetle parasite.--T. R. Gardner, Moorestown, reports that "Several Phyllophaga grubs parasitized with Dexia ventralis Ald. last fall and overwintered in the cold cellar were dissected to determine condition of the immature stages of the parasite. One dexiid larva had died, apparently shortly after entrance into the host, and two larvae were normal and healthy in the second instar. This shows that the larvae of D. ventralis can overwinter in the normal second stage in grubs of Phyllophaga."